**SUBMISSION OF THE**

**NATIONAL AIR TRAFFIC CONTROLLERS ASSOCIATION**

**TO THE**

**NATIONAL TRANSPORTATION SAFETY BOARD**

**REGARDING THE ACCIDENT INVOLVING**

**COMAIR AIRLINES FLIGHT 5191**

**AT LEXINGTON, KENTUCKY**

**AUGUST 27, 2006**

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## I. ACCIDENT

On August 27, 2006, at approximately 0607 Eastern Daylight Time, Comair Flight 5191, a Bombardier CL-600-2B19 (CRJ-100), N431CA, crashed during takeoff from Blue Grass Airport, Lexington, Kentucky. The aircraft, which had been cleared for Runway 22, taxied onto Runway 26 instead and ran off the end of Runway 26. Of the 47 passengers and 3 crewmembers on board, 49 were killed, and 1 received serious injuries. Impact forces and post crash fire destroyed the airplane. The flight was operating under the provisions of 14 Code of Federal Regulations Part 121 and was destined for Atlanta International Airport.

## II. PROBABLE CAUSE OF THE ACCIDENT

The probable cause of the accident was Comair 5191 crew's failure to maintain situational awareness while taxing for departure as well as the failure of the crew to ascertain that the runway they were taking off from was the assigned departure runway.

## III. CONTRIBUTING FACTORS

Contributing to the crew's mistakes was the failure of the Federal Aviation Administration management to properly staff the Air Traffic Control tower. The Federal Aviation Administrations directives in place at the time of the accident required there to be two controllers in the tower during the midnight shift. At the time of the accident, there was only one controller in the tower.

## IV. HISTORY OF FLIGHT

The First Officer called for and received an air traffic control clearance to Atlanta at approximately 05:43 local time. At approximately 05:59 the First Officer asked for and was given a taxi clearance from the gate to Runway 22. This taxi clearance is what the crew expected because they had received information "Alpha." Information "Alpha" clearly advised them that Runway 22 was the active runway.

The crew programmed Runway 22 into the FMS system and briefed that the departure runway would be Runway 22. At approximately the hold short line for Runway 26, the aircraft stopped for approximately 45 seconds. At approximately 0604, the crew then asked for and was granted takeoff clearance for Runway 22.

At approximately 0605, the crew incorrectly attempted to takeoff from the unlit Runway 26. Approximately 35 seconds later, the accident sequence began.

## V. RUNWAY 22 AND THE COCKPIT VOICE RECORDER

The following section is added in order to illustrate that the crew was indeed expecting to utilize Runway 22 for the takeoff. Based on the transcripts of the CVR, the following is evident:

- At 05:48:24, as the crew is listening to ATIS information "ALPHA," the crew is informed that the Lexington airport is "Landing and Departing Runway 22."

- At 05:56:34, the First Officer, while briefing the takeoff states, "right seat flex takeoff procedures of um…. He said runway ?—one of 'em. *two four." The Captain then corrects the First Officer that the departure runway is, "its two two." (Runway 22)

- At 05:56:49.9, the First Officer continues the takeoff briefing, "two two up to six…." (Runway 22, up to six thousand)

- At 05:57:23.3, the First Officer continues with a taxi brief and states, "let's take it out and um, take uuuh, Alpha. Two two's a short taxi." (Short taxi to Runway 22)

- At 05:57:31.1, the Captain acknowledges the taxi brief by responding, "yeah."

- At 05:57:35.4, the First Officer asks the Captain, "any questions?"

- At 05:57:36.5, The Captain replies, "no questions…."

- At 06:02:03.8, The Lexington Air Traffic Controller clears Comair Flight 191 to taxi to Runway 22. Shortly afterwards, the First Officer acknowledges.

- At 06:04:05, while the First officer is performing the "Before Takeoff" checklist, the First Officer states, "…FMS we got Runway 22 out of Lexington up to six."

- At 06:05:17, the controller clears Comair 191—"fly runway heading, cleared for takeoff."

- At 06:05:21, Comair flight 191 acknowledges.

From this conversation, it is reasonable to assume that there was no misunderstanding between the air traffic controller and the crew over the fact that the assigned runway was Runway 22 and that the expectation was for a Runway 22 departure.

## VI. CREW LOST SITUATIONAL AWARENESS

According to the Comair Operations manual regarding taxi procedures, it is required that the Captain perform a taxi briefing prior to taxi that would include verbalization of the routing and emphasize runway crossings. Additionally, the Comair taxi procedures required both crewmembers to monitor the progress of the taxi utilizing the HSI, airport diagrams, and airport signage in order to confirm position.

The Comair Operations manual also states that when the aircraft is clear of the ramp, the Captain shall verbalize the essential elements of the taxi clearance placing special emphasis on the following:

- Runway crossings
- Hold short lines
- Hold short instructions
- Runway incursion hotspots

The manual also states that it is the responsibility of the Captain and the First Officer to maintain situational awareness at all times.

During the course of the investigation, it was discovered that the ATIS recording did not include the NOTAM # A-1682, that states that taxiway A north of Runway 26 was closed until further notice. It was also discovered that the Jeppesen airport diagram that the crew was utilizing was not correct.

The crew taxied on taxiway "A" and stopped the aircraft at the hold short position for Runway 26. When the crew of Comair 5191 stopped the aircraft at the hold short line for Runway 26, it is possible that the crew believed that they were holding at the hold short line for Runway 22. This is plausible knowing that the Jeppson airport diagram was incorrect and the NOTAM A—1682 was not broadcast with the ATIS. However, the airport signage from the viewpoint of the Captains position was clear—they were holding short of Runway 26. Additionally, the HSIs in the cockpit would have indicated that the aircraft was at the hold short line for 26 and not at the hold short line for Runway 22.

## VII. CREW FAILED TO VERIFY THAT THE RUNWAY USED WAS THE ASSIGNED RUNWAY

At 06:05:17, the controller cleared Comair flight 191 to fly runway heading and cleared them for takeoff. At that time, according to the Flight Data Recorder, the crew had their heading bugs set to 227 degrees, which essentially indicates that, the crew had the heading bugs set for the "assigned" Runway 22. There were several sources of heading information that were presented to the crew, all of which were showing the heading bug selected for the correct runway departure—Runway 22. As the crew was adding power for the takeoff roll, it should have been evident that the heading information was not consistent with a Runway 26 departure.

## VIII. NTSB SAFETY RECOMMENDATIONS

On December 12, 2006 the NTSB issued recommendation A-06-83 that stated as follows:

> Require that all 14 Code of Federal Regulations Part 121 operators establish procedures requiring all crewmembers on the flight deck to positively confirm and cross-check the airplanes location at the assigned departure runway before crossing the hold-short line for takeoff.

Additionally, on December 12, 2006, the NTSB issued recommendation A-06-84 that stated as follows:

> Require that all 14 Code of Federal Regulations Part 121 operators provide specific guidance to pilots on the runway lighting requirements for takeoff operations at night.

The National Air Traffic Controller Association concurs with these recommendations.

## IX. CREW INITIATED TAKEOFF ON DARK RUNWAY

The controller stated that he had never observed an airline flight depart on Runway 26. Additionally, the witness interviews conducted during the field investigation indicated that most pilots would not, or were not sure they had the authority to, takeoff from a runway that is not lit.

## X. FAA STERILE COCKPIT PROCEDURES

Relevant Federal Aviation Administration regulations state as follows regarding sterile cockpit procedures:

> 121.542 Flight crewmember duties
>
> (a) No certificate holder shall require, nor may any flight crewmember perform, any duties during a critical phase of flight except those duties required for the safe operation of the aircraft. Duties such as company required calls made for such non safety related purposes as ordering galley supplies and confirming passenger connections, announcements made to passengers promoting the air carrier or pointing out sights of interest, and filling out company payroll and related records are not required for the safe operation of the aircraft.
>
> (b) No flight crewmember may engage in, nor may any pilot in command permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his or her duties or which could interfere in

any way with the proper conduct of those duties. Activities such as eating meals, engaging in nonessential conversations within the cockpit and nonessential communications between the cabin and cockpit crews, and reading publications not related to the proper conduct of the flight are not required for the safe operation of the aircraft.

(c) For the purposes of this section, critical phases of flight includes all ground operations involving taxi, takeoff and landing, and all other flight operations conducted below 10,000 feet, except cruise flight. Note: Taxi is defined as "movement of an airplane under its own power on the surface of an airport."

## XI. COMAIR STERILE COCKPIT PROCEDURES

The Comair Operations Manual, Chapter 5 section 5.13.2, titled--Critical Phases of Flight/Sterile Cockpit states in part as follows:

- Critical phase of flight includes all ground operations involving taxi, takeoff and landing, and all other flight operations conducted below 10,000 ft, except cruise flight. Taxi is defined as "movement of an aircraft under its own power on the surface of the airport."

- No flight crewmember shall perform any duties during a critical phase of flight except those duties required for the safe operation of the aircraft.

- No flight crewmember may engage in, nor may any pilot-in-command permit, any activity during a critical phase of flight which could distract any flight crewmember from the performance of his duties or which could interfere in any way with the proper conduct of those duties. Activities such as engaging in nonessential conversations within the flight deck. . .

## XII. COMAIR FLIGHT 5191 AND THE STERILE COCKPIT REQUIREMENT

Both the Federal Aviation Administration and the Comair Operations Manual require that all crews refrain from nonessential conversations during critical phases of flight. This requirement is necessary to prevent any distractions. It is also noteworthy that both the FAA and Comair define taxi as "the movement of the aircraft under its own power on the airport surface."

In the case of Comair Flight 5191, the air traffic controller cleared the aircraft to taxi to Runway 22 at 06:02:03.8. The Flight Data Recorder indicates that at approximately 06:02:17, the aircraft began to move under its own power. The aircraft was cleared for takeoff at 06:05:15 - from the time the aircraft began to taxi until the time the aircraft was cleared for takeoff was 2 minutes and 58 seconds. During this time, the crew engaged in the following non-essential conversations:

- At 06:03:16.4 the first officer says, "yeah, I know three guys at Kennedy. Actually two guys uh…. he went but he didn't get past the sim."

- At 06:03:26.7 the captain responds "oh, really."

- At 06:03:26.7 the first officer says, "and then um, a First Officer from Cinc…."

- At 06:03:35.1 the First Officer says, "got through the second part…."

- At 06:03:37.2 the First Officer says "what do you do the uh, these tests…. and he didn't, and that's as far as he got."

- At 06:03:49.3 The First Officer continues, "and then @@ he actually got offered the position."

- At 06:03:54.5 the Captain says, "Did he take it or…."

- At 06:03:55.5 the First Officer "yeah."

- At 06:03:56 the Captain states, "ahh okay."

It should also be noted that at 05:57:23, the First Officer - while conducting the required taxi brief - states "let's take it out um, take uuuh, Alpha. Two two's a short taxi." The taxi was short. The crew had approximately 2 minutes and 58 seconds to do all the required checks prior to takeoff.

## XIII. THE AIR TRAFFIC CONTROL TOWER

Per FAA policy currently in effect at the time of the accident, the air traffic control tower was required to have two qualified air traffic controllers on duty and present at the time of the accident. However, on the day of the accident, there was only one controller performing both the radar function and the tower function.

During the time frame prior to the accident, the tower controller was performing the following activities (beginning at 0543:35, which was approximately 23 minutes prior to the takeoff clearance being issued to Comair flight 5191):

- Issued SKW 6819 an IFR clearance to Chicago.
- Issued EGF882 an IFR clearance to Dallas Fort Worth.
- Issued COM5191 an IFR clearance to ATL
- Recorded the new ATIS—Information "B."
- Approved the push- back for SKW6819.
- Approved the pushback for EGF882.
- Communicated with the Indianapolis center for release of SKW6819 to Chicago.

- Provided taxi clearance to SKW6819 to Runway 22.
- Approved the pushback for COM5191.
- Provided taxi clearance to EGF882 to Runway 22.
- Issued SKW6819 takeoff clearance from Runway 22.
- Advised EGF882 to hold short.
- Provided taxi clearance to COM5191 to Runway 22.
- Issued EGF882 takeoff clearance from Runway 22.
- Radar identified SKW6819.
- Validated the Mode-C of SKW6819.
- Provided departure control instructions to SKW6819.
- Initiated handoff of SKW6819 to ZID.
- Radar identified EGF882.
- Validated the Mode-C of EGF882.
- Approved weather deviations for SKW6819.
- Analyzed the D-BRITE radar display regarding weather deviations of SKW6819.
- Communicated with Indianapolis center for the release of COM5191 to Atlanta.
- Coordinated with an additional Indianapolis controller regarding the weather deviations of SKW6819.
- Provided communications transfer to Indianapolis center of SKW6819.
- Provided departure control instructions to EGF882.
- Initiated handoff of EGF882 to ZID.
- Issued COM5191 takeoff clearance from Runway 22.
- Analyzed the D-BRITE radar display regarding EGF882-- and possible weather deviations.
- Actively initiated a conversation with the crew of EGF882 pertaining to possible weather deviations.
- Initiated the requirement to complete the nightly traffic count.

## XIV. THE SPLITTING OF THE TOWER AND RADAR FUNCTION

At the time of the accident, the FAA required that there be two controllers in the tower and that the tower function be split from the radar function. Of the thirty-one (31) bullets of controller activity discussed in the previous section, fourteen (14) of these activities would have been performed by the radar controller had the positions been split and an additional controller was on the shift.

The tower controller would have managed the airport surface activities and the radar controller would have been engaged in the airborne air traffic activities. In addition, it is probable that there would have been another set of “eyes” in the tower (the controller reported that when he worked the midnight shift with an additional controller that they would have both been operating in the tower cab). Clearly, this configuration would be considered preferable.

It should be noted that since the accident, the Lexington air traffic control tower is now always staffed with two (2) air traffic controllers during the midnight shifts, with the tower and radar functions split.

## XV. CONTROLLER REQUIREMENTS AND EXPECTATIONS

According to the Controllers Handbook 7110.65, controllers are required to perform the following actions prior to issuing a takeoff clearance to any aircraft:

- Scan the runway to determine it is clear of aircraft, vehicles, men and equipment.
- Scan the departure corridor for airborne traffic.

In the case of this accident, the controller indeed met these requirements.

At the time of the accident, the only runway that was lit on the airport surface was Runway 22. During the course of the investigation, it was determined that the runway lights for Runway 26 were off.

The expectation of air traffic controllers is that a professional airline crew will depart the runway that they are cleared for. Additionally, air traffic controllers would not expect a crew to attempt a takeoff on a runway that has no lights.

## XVI. FAA STAFF STUDY ISSUED IN MARCH OF 2005

In March of 2005, the Lexington Air Traffic Control Tower produced a study that analyzed a reduction in operating hours for the facility. The review was necessitated by the Agency's requirement to effectively manage limited staffing resources and to align these resources to support periods of higher density operations. The study was prepared for the FAA to make an informed decision on reducing hours of operation that the tower would be open.

On page five of the study, the author states that a staffing number of nineteen (19) for the facility is not realistic if twenty-four (24) hour service is to be maintained. Additionally, the author concluded that the midshifts practice created an overtime liability for the Agency, should an employee become incapacitated due to illness.

NATCA's position is that the FAA does have the authority and ability to analyze reducing operating hours of facilities but that cost savings and re-alignment of personnel should not be the only considerations taken into account. The Lexington Control Tower is a "case in point." The goal of making Lexington a part-time facility may be legitimate, but only if safety is not degraded in the process.

## XVII. FAA'S FAILURE TO PROPERLY STAFF THE LEXINGTON CONTROL TOWER

The Federal Aviation Administration has a mandate to ensure that the National Airspace System (the NAS) functions safely. This mandate includes the requirement that the FAA properly staff all air traffic control facilities to ensure the safety of the American public. In the case of the Lexington air traffic control tower, the FAA clearly failed to meet this mandate.

A study of the NTSB's Air Traffic Control Group Factual Report that was generated as a result of the Comair 1591 accident demonstrates the current failure of FAA management to meet the mandate of proper staffing. For example, some of the FAA management correspondence pertaining to the lack of resources at the Lexington control tower reads as follows:

- On November 16, 2005 the Air Traffic Manager of the Lexington control tower issued a memo to all supervisors and controllers that the midnight shift be staffed with two controllers and the radar function and the tower function will be split.

- On January 12, 2006, the Air Traffic Manager of the Lexington control tower articulated to his superior via e-mail that the Lexington control tower was unable to meet the requirement to staff the midshifts with two controllers because of the insufficient number of controllers at the facility. The manager requested an additional two controllers or an increase in the overtime budget of $75,000.00. Upper management never directly addressed these requests.

- On February 13, 2006, the Hub Manager (the Lexington tower manager's superior) responded by reiterating to the Lexington tower manager that the overtime budget would remain at the previous level of $17000.00. Additionally, the Hub manager stated his expectation that the Lexington tower manager operate the tower within the original budget and that the yearly assessment of his own job performance should reflect his ability to do so.

- On April 21, 2006, the Lexington tower manager again advised his superior that he was still not in a position to staff the tower on the midshifts as required, due to a lack of resources.

- During the midshift on August 27, 2006, Comair 5191 attempted to takeoff on an incorrect runway. The Controller did not observe this mistake.

## XIII. CONTROL TOWER VANTAGE POINT - RUNWAYS 22 AND 26

From the control tower, aircraft taxiing to Runway 22 and Runway 26 can appear to be very similar at the point at which an aircraft begins to turn the aircraft towards either runway from taxiway A. The NTSB identified this fact while they were conducting night taxi tests at the airport.

Additionally, if a controller was at the D-BRITE position while also clearing an aircraft for takeoff, there is an angle in the tower windows that could obscure the controller's vision. Had the controller been working from the local position instead of the D-BRITE position, the controller would have been in a better position to observe the Comair attempt to takeoff on the incorrect runway.

## XIX. CIRCADIAN CYCLE

The following information is based on research from Scott Shappell, PH.D., Clemson University. It was taken from a presentation he gave at NATCA's Communicating for Safety Conference held September 9-11, 2006 and NATCA believes it is relevant to mention during this investigation.

> Each person has something in his or her bodies called a "circadian cycle". It is an internal clock, which tells your body when it is time to rest and when it is time to be at your best. Given the typical circadian cycle, performance peaks between 1200 and 2100 hours and falls to a minimum circadian trough between 0300 and 0600 hours. The circadian cycle differs from most clocks in that it is flexible and must be set, or synchronized, before it can accurately predict the timing of events.
>
> Examples of external synchronizers include sunrise/sunset, ambient temperature, meals and social cues. Sleep requirements vary dramatically among individuals. A minimum of 5 hours of uninterrupted "core" sleep during the circadian trough is necessary to maintain optimal performance.
>
> In the cockpit, or an ATC facility, where environmental factors and physical and mental workload exceed normal limits, the minimum amount of sleep needed to sustain performance is more. It is the timing of sleep, not necessarily the amount of sleep that is most significant. When sleep is not available or shortened by operational concerns, combat naps are a viable alternative. Combat naps are naps lasting 10-20 minutes. They are meant to be restorative in nature.
>
> http://safety.natca.net/2006cfsspeakerpresentations.htm

## XX. CONCLUSION

The National Air Traffic Controllers Association has determined that this accident was preventable. There was no misunderstanding between the crew and the air traffic controller over the fact that Runway 22 was the assigned runway.

The crew of Comair 5191 discussed the taxi and it was mentioned that the taxi would be short. Contrary to Comair procedures, the crew did not specifically brief runway crossings and did not verbalize the taxi after brake release. The taxi was to be a short taxi. The "taxi" check and the "before takeoff" check were performed. This was to be performed in approximately 2 minutes and 58 seconds.

From 06:03:16.4 until 06:04:01.2 (according to the CVR) the crew engaged in non-essential conversation. This conversation took approximately 45 seconds. Additionally, the First Officer performed a PA announcement while the aircraft was stationary at the Runway 26 hold short position.

When the aircraft was holding short of Runway 26, the crew believed that they were in fact holding short of Runway 22. The Hold-Short sign that indicated the crew was stopped at the Runway 26 hold short line was entirely visible to the Captain.

Coupled with this situation was the fact that the sole Air Traffic Controller on duty was dedicating his attention to radar duties and looking at the D-BRITE display. While the Controller was performing radar duties, Comair Flight 5191 called for takeoff clearance. The Controller cleared the flight for takeoff, observed the aircraft turning towards Runway 22, and expected the flight to utilize Runway 22 - he certainly could in no way expect the flight to attempt to takeoff from un-lit Runway 26.

Satisfied that Comair Flight 5191 would do exactly what the previous two departures had done, the Controller initiated other required duties. The Controller did not observe the aircraft depart Runway 26.

The Federal Aviation Administration failed to follow its own directives. Depending on which management individual was interviewed during this investigation, it is now evident that some managers believed that it was a requirement, even a policy, to staff the Lexington control tower with two controllers while other managers called the staffing requirement of two controllers just "verbal guidance."

Had there been two controllers in the tower, as required, NATCA's position is that this accident would not have happened for the following reasons:

- The "Tower" function and the "Radar" function would have been split.

- There would have been two controllers in the facility, most likely in the cab.

- Even if both controllers were not in the cab, the workload would have been such that the local controller would be dedicating his attention to the airport surface, including the area of the airport in which the Comair flight made its errors.

In sum, two sets of eyes clearly would have been helpful. As stated during the NTSB interviews by the controller himself, when he worked the midshifts with two controllers, both controllers would work together from the tower cab.

## XXI. NATCA RECOMMENDATIONS

NATCA recommends that the NTSB propose that the FAA and NATCA form a collaborative working group to research the effects of fatigue and its affect on controller performance. Additionally, NATCA recommends that the NTSB require the FAA to set working hour limits and facility staffing standards for air traffic controllers based on fatigue research, circadian rhythms, and sleep and rest requirements.

Submitted March 26, 2007.